

Class Notes

GROUP #: A

Student IDs of Members Present:

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Gravitational
Energy



Gravitation
&
Chemical e

Lithosphere

Magma
production

Thermal energy

Part 2. Group Work

A. Step back for a moment. In your group's own words, explain the following ideas:

Gravitational energy: Energy from the earth pulling things down.

Thermal energy: movement of molecules

Chemical energy: Energy from a reaction involving molecules.

Buoyancy: when something is less dense in a liquid, needs gravity to function.

Lithosphere: Tectonic plate below ocean floor, also on continental lithosphere, gets 1.

Asthenosphere: Solid rock below lithosphere, hotter rock

Why Melting Occurs at Subduction Zones: water released into the lithosphere dense as it sinks.

MAKE SURE EVERYONE UNDERSTANDS THESE IDEAS BEFORE MOVING ON!

B. Label the diagram above to indicate the types of energy driving plate tectonics processes, including magma production.

ISP203A – Global Change
Buoyancy

- C. Complete the table below and identify the causal processes involved with magma rising through the lithosphere.

Factors Impacting:	Aspects of the magma or surrounding lithosphere:
Density of the magma	composition, addition of water
Buoyancy of the magma/lithosphere system	Magma/lithosphere becomes less dense and rises.

- D. When magma rises through the crust, the magma cools and the crust gets hotter as heat is transferred from the magma to the crust. Explain what happens to density during this process and how it will affect a magma rising through the crust:

Magma cooling:

Density is increasing

They stop and remain once they reach equilibrium.

Crust warming:

Density is decreasing

- E. Ocean crust is dense and composed mostly of basalt, while continental crust is lower in density and composed mostly of granite. Considering the density differences, would the buoyant force on a basaltic magma be greater in the ocean crust or the continental crust? Explain your reasoning.

The buoyant force is pressure and will be greater within the oceanic crust due to the amount of weight on top creating more pressure.

Class Notes

GROUP #: **B**

Student IDs of Members Present:

~~XXXXXXXXXX~~ A4142284

~~XXXXXXXXXX~~ A39963430

~~XXXXXXXXXX~~ A43979706

~~XXXXXXXXXX~~ A40290629



Part 2. Group Work

A. Step back for a moment. In your group's own words, explain the following ideas:

Gravitational energy: energy that draws objects to another

Thermal energy: movement of molecules (heat energy)

Chemical energy: Composition-arrangement of atoms & molecules

Buoyancy: The rising and sinking of materials

Lithosphere: Cold tectonic plate - outermost part of earth

Asthenosphere: solid rock under lithosphere - hot

Why Melting Occurs at Subduction Zones: Change of composition due to water molecules of rock from the ocean - lithosphere carries it

MAKE SURE EVERYONE UNDERSTANDS THESE IDEAS BEFORE MOVING ON!

B. Label the diagram above to indicate the types of energy driving plate tectonics processes, including magma production.

ISP203A – Global Change
Buoyancy

C. Complete the table below and identify the causal processes involved with magma rising through the lithosphere.

Factors Impacting:	Aspects of the magma or surrounding lithosphere:
Density of the magma	The composition caused the density of the rock to change due to the water that was added from the sinking oceanic plate.
Buoyancy of the magma/lithosphere system	Density decreases because the magma decreases in temperature - a liquid has lower density than solids so it is more buoyant.

D. When magma rises through the crust, the magma cools and the crust gets hotter as heat is transferred from the magma to the crust. Explain what happens to density during this process and how it will affect a magma rising through the crust:

Magma cooling: When magma cools, it increases in density because it is hardening/cooling at the surface

Crust warming:

The crust warming decreases in density as it is exposed to the heat of the surrounding rock

E. Ocean crust is dense and composed mostly of basalt, while continental crust is lower in density and composed mostly of granite. Considering the density differences, would the buoyant force on a basaltic magma be greater in the ocean crust or the continental crust? Explain your reasoning.

The buoyant force on magma would be greater in the continental crust due to its lower density. Oceanic crusts are cooler and harder, resulting in a higher density and less melting of rock.

Class Notes

GROUP #: C
Student IDs of Members Present:

A42609057

A42483118

A42941352

A42226052



① gravit

② thermal

③ chemical

due to diff compos

Part 2. Group Work

A. Step back for a moment. In your group's own words, explain the following ideas:

Gravitational energy: The force energy that pulls an object towards the center of the Earth.

Thermal energy: The energy from heat.

Chemical energy: The energy from the ~~temp~~ change in composition.

Buoyancy: Relative densities

Lithosphere: Mantle + crust, brittle

Asthenosphere: Underneath lithosphere, solid/plastic like.

Why Melting Occurs at Subduction Zones: Because of the existence of water.

MAKE SURE EVERYONE UNDERSTANDS THESE IDEAS BEFORE MOVING ON!

B. Label the diagram above to indicate the types of energy driving plate tectonics processes, including magma production.

Above! ☺

ISP203A – Global Change
Buoyancy

- C. Complete the table below and identify the causal processes involved with magma rising through the lithosphere.

Factors Impacting:	Aspects of the magma or surrounding lithosphere:
Density of the magma	<ul style="list-style-type: none"> #1: energy #5 temp #6 density + temp #7
Buoyancy of the magma/lithosphere system	melted rock will rise

composition
w/ water,
pressure,
heat

- D. When magma rises through the crust, the magma cools and the crust gets hotter as heat is transferred from the magma to the crust. Explain what happens to density during this process and how it will affect a magma rising through the crust:

Magma cooling:

Density will be less dense if it is heated up so as it cools off (as a result of equilibrium) it stops rising and stays where it is in equilibrium.

Crust warming:

If the crust warms substantially, the magma will be more prone to rise further since it will find equilibrium higher up.

- E. Ocean crust is dense and composed mostly of basalt, while continental crust is lower in density and composed mostly of granite. Considering the density differences, would the buoyant force on a basaltic magma be greater in the ocean crust or the continental crust? Explain your reasoning.

The force would ~~be~~ have a stronger force against it if it was in the continental crust since the relative density is much stronger!

Class Notes

GROUP #: D
Student IDs of Members Present:
A43570651 44017778
A37599308



are
pressure
is on
down

Thermal
Chemical
pushing lava
up to surface
geothermal
Thermal &
chemical
melt magma
up

gravitational energy pushes water
down from the ocean into the lithosphere & a chemical action water
also occurs

Part 2. Group Work

A. Step back for a moment. In your group's own words, explain the following ideas:

Gravitational energy: movement of molecules due to gravity

Thermal energy: heating & cooling of molecules

Chemical energy: movement of molecules which results in a change in matter

Buoyancy: force equal to the weight of displaced water

Lithosphere: tectonic plate; either oceanic (flexible) or continental (higher up)

Asthenosphere: solid rock; hot under more pressure → more dense, sitting lower

Why Melting Occurs at Subduction Zones:

MAKE SURE EVERYONE UNDERSTANDS THESE IDEAS BEFORE MOVING ON!

B. Label the diagram above to indicate the types of energy driving plate tectonics processes, including magma production.

ISP203A – Global Change
Buoyancy

- C. Complete the table below and identify the causal processes involved with magma rising through the lithosphere.

Factors Impacting:	Aspects of the magma or surrounding lithosphere:
Density of the magma	#1, 5, 6, 7 temperature pressure composition
Buoyancy of the magma/lithosphere system	#7, 6 density composition temperature

- D. When magma rises through the crust, the magma cools and the crust gets hotter as heat is transferred from the magma to the crust. Explain what happens to density during this process and how it will affect a magma rising through the crust:

Magma cooling:

more dense because it is a liquid turning into a solid

Crust warming:

less dense because it is heating up. Also causes crust to become more brittle.

- E. Ocean crust is dense and composed mostly of basalt, while continental crust is lower in density and composed mostly of granite. Considering the density differences, would the buoyant force on a basaltic magma be greater in the ocean crust or the continental crust? Explain your reasoning.

The buoyant force would be greater in the denser oceanic crust because there is more pressure on the more dense crust which is displaced or subducted under the less dense continental crust.

Class Notes

GROUP #: **E**

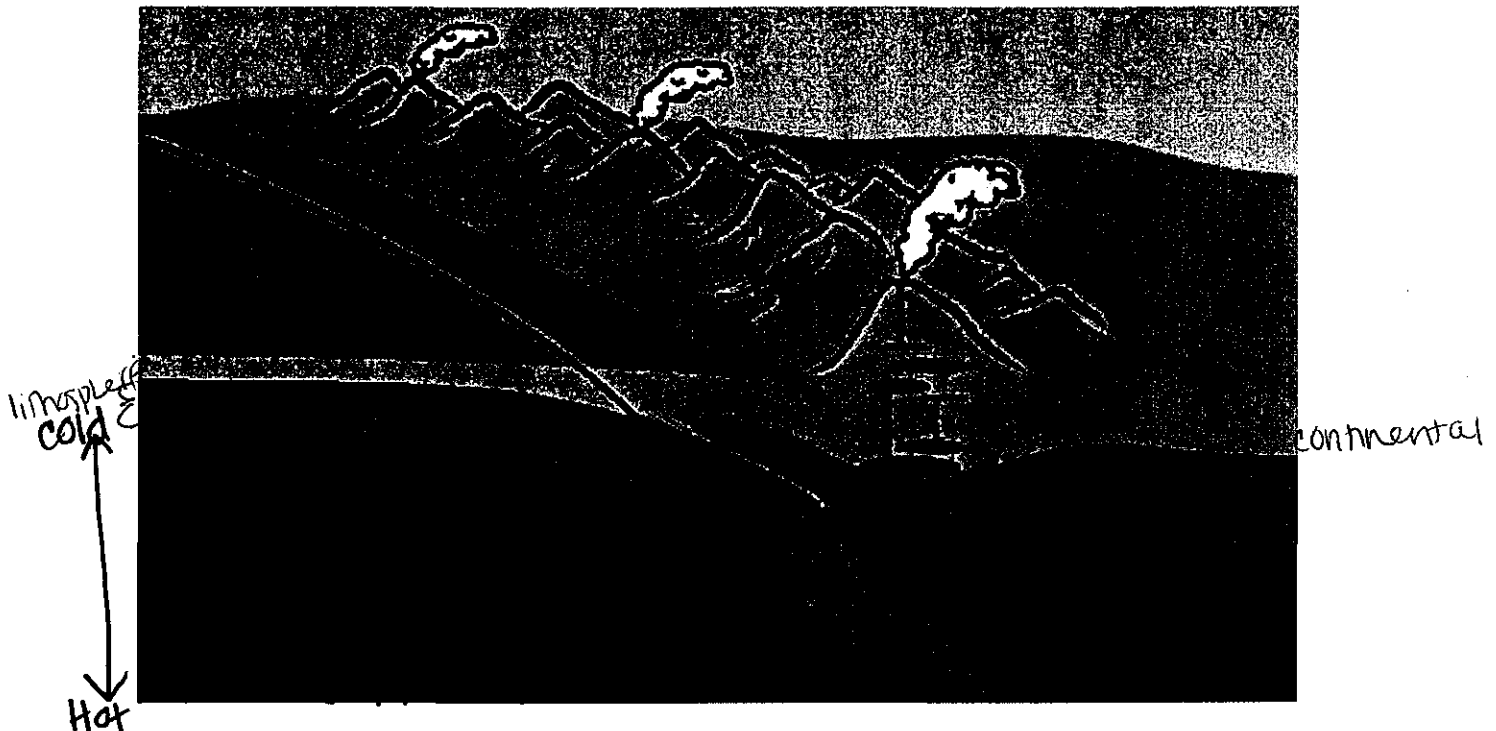
Student IDs of Members Present:

~~XXXXXXXXXX~~ A42190700

~~XXXXXXXXXX~~ A39228166

~~XXXXXXXXXX~~ A40518651

~~XXXXXXXXXX~~ A41503028



Part 2. Group Work

A. Step back for a moment. In your group's own words, explain the following ideas:

Gravitational energy: ~~energy~~ energy that pulls/pushes objects together

Thermal energy: movement of molecules results in energy

Chemical energy: energy that results from arrangement of atoms + molec

Buoyancy: the force that is equal to the weight of the water the object displaces

Lithosphere: materials rising and falling due to density. Tectonic plate includes crust + plate (brittle)

Asthenosphere: bendable, but solid layer of plates

Why Melting Occurs at Subduction Zones: ~~increasing temperature as you go into sub~~

~~at earth's core~~ composition and water. water molecules release heat as they melt

of pressure. melting occurs because of water being added to asthenosphere

MAKE SURE EVERYONE UNDERSTANDS THESE IDEAS BEFORE MOVING ON! Spherical Rock

B. Label the diagram above to indicate the types of energy driving plate tectonics processes, including magma production.

ISP203A – Global Change
Buoyancy

C. Complete the table below and identify the causal processes involved with magma rising through the lithosphere.

Factors Impacting:	Aspects of the magma or surrounding lithosphere:
Density of the magma	↓ temp makes it less dense so it rises more buoyancy causes it to be less dense The pressure of the surrounding material affects the density of the magma
Buoyancy of the magma/lithosphere system	chemical ^{energy} helps drive the change in matter, making the magma less dense + more buoyant. -The density will eventually hit equilibrium and stop rising

D. When magma rises through the crust, the magma cools and the crust gets hotter as heat is transferred from the magma to the crust. Explain what happens to density during this process and how it will affect a magma rising through the crust:

Magma cooling: density ^{increases} ~~decrease~~ b/c its cooling

Crust warming: density ^{decreases} ~~increases~~ b/c it's warmer

E. Ocean crust is dense and composed mostly of basalt, while continental crust is lower in density and composed mostly of granite. Considering the density differences, would the buoyant force on a basaltic magma be greater in the ocean crust or the continental crust? Explain your reasoning.

The buoyant force would be greater on the ~~ocean crust~~ ^{continental crust} because it is less dense.

Class Notes



Part 2. Group Work

A. Step back for a moment. In your group's own words, explain the following ideas:

Gravitational energy: *Energy effected by gravity*

Thermal energy: *Heat energy*

Chemical energy: *effects chemical compositions*

Buoyancy: *How well an object floats*

Lithosphere: *Top layer of earths crust*

Asthenosphere: *layer below the lithosphere*

Why Melting Occurs at Subduction Zones: *change in composition, water molecules cause the melting*

MAKE SURE EVERYONE UNDERSTANDS THESE IDEAS BEFORE MOVING ON!

B. Label the diagram above to indicate the types of energy driving plate tectonics processes, including magma production.

ISP203A – Global Change
Buoyancy

- C. Complete the table below and identify the causal processes involved with magma rising through the lithosphere.

Factors Impacting:	Aspects of the magma or surrounding lithosphere:
Density of the magma	pressure
Buoyancy of the magma/lithosphere system	less dense magma

- D. When magma rises through the crust, the magma cools and the crust gets hotter as heat is transferred from the magma to the crust. Explain what happens to density during this process and how it will affect a magma rising through the crust:

Magma cooling: density increases causing the magma to sink

Crust warming: density decreases causing the warmer crust to rise

- E. Ocean crust is dense and composed mostly of basalt, while continental crust is lower in density and composed mostly of granite. Considering the density differences, would the buoyant force on a basaltic magma be greater in the ocean crust or the continental crust? Explain your reasoning.

Ocean crust because the pressure from the ocean is greater than the pressure from the continental crust.

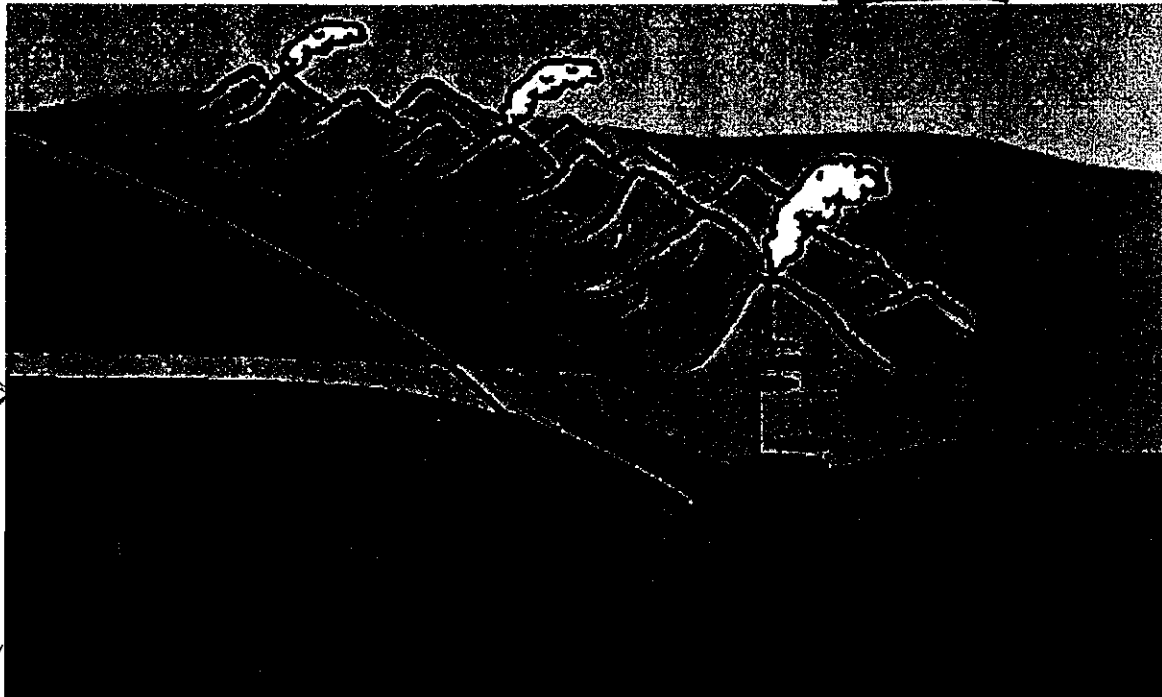
Class Notes

GROUP #: 11

Student IDs of Members Present:

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Part 2. Group Work

A. Step back for a moment. In your group's own words, explain the following ideas:

Gravitational energy: Energy that causes objects to change in position.

Thermal energy: The motion in an object moving.

Chemical energy: Energy that causes composition of a matter to change.

Buoyancy: Causes material to sink or rise due to relative density.

Lithosphere: rock; colder; brittle; breakable; where earthquakes occur.

Asthenosphere: rock; harder; solid; hotter; more pressure; bendable.

Why Melting Occurs at Subduction Zones:

Melting occurs due to water which causes compositional change.

MAKE SURE EVERYONE UNDERSTANDS THESE IDEAS BEFORE MOVING ON!

B. Label the diagram above to indicate the types of energy driving plate tectonics processes, including magma production.

ISP203A – Global Change
Buoyancy

C. Complete the table below and identify the causal processes involved with magma rising through the lithosphere.

Factors Impacting:	Aspects of the magma or surrounding lithosphere:
Density of the magma	composition
Buoyancy of the magma/lithosphere system	melted rocks rise.

D. When magma rises through the crust, the magma cools and the crust gets hotter as heat is transferred from the magma to the crust. Explain what happens to density during this process and how it will affect a magma rising through the crust:

Magma cooling: During cooling of magma, it will eventually stop rising to reach a state of equilibrium.

Crust warming: During the process of equilibrium the magma is causing the crust around it to warm.

E. Ocean crust is dense and composed mostly of basalt, while continental crust is lower in density and composed mostly of granite. Considering the density differences, would the buoyant force on a basaltic magma be greater in the ocean crust or the continental crust? Explain your reasoning.

Ocean crust because it is already made of dense basalt so adding more dense basalt = greater pressure. On the continental crust it would take more basalt to have the same effect. Greater density = Greater Buoyancy force.

Class Notes

GROUP #: **I**
Student IDs of Members Present:
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Part 2. Group Work

A. Step back for a moment. In your group's own words, explain the following ideas:

Gravitational energy: Force of gravity on an object

Thermal energy: heat energy.

Chemical energy: energy created from bonds being broken and formed

Buoyancy: The process by which materials rise and sink

Lithosphere: breakable layer of rock under the ocean crust

Asthenosphere: The solid / bendable layer of rock under the asthenosphere

Why Melting Occurs at Subduction Zones: composition change, adding water to rock makes them melt.

MAKE SURE EVERYONE UNDERSTANDS THESE IDEAS BEFORE MOVING ON!

B. Label the diagram above to indicate the types of energy driving plate tectonics processes, including magma production.

ISP203A – Global Change
Buoyancy

- C. Complete the table below and identify the causal processes involved with magma rising through the lithosphere.

Factors Impacting:	Aspects of the magma or surrounding lithosphere:
<u>Density</u> of the magma	Temperature
<u>Buoyancy</u> of the magma/lithosphere system	Buoyancy forces

- D. When magma rises through the crust, the magma cools and the crust gets hotter as heat is transferred from the magma to the crust. Explain what happens to density during this process and how it will affect a magma rising through the crust:

Magma cooling:

Density increases due to cooling of the magma.
This causes it to stop and pool.

Crust warming:

As the crust warms, this causes an unbalance in the equilibrium. Thus the cooled magma heats up and becomes less dense, causing it to rise again.

- E. Ocean crust is dense and composed mostly of basalt, while continental crust is lower in density and composed mostly of granite. Considering the density differences, would the buoyant force on a basaltic magma be greater in the ocean crust or the continental crust? Explain your reasoning.

greater on the oceanic crust is more dense because the buoyant force is stronger.

Class Notes

A-46461394

GROUP #: K
Student IDs of Members Present:

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A43330797

A42627086



gravity
Temp

Part 2. Group Work

A. Step back for a moment. In your group's own words, explain the following ideas:

Gravitational energy: Pull of gravity

Thermal energy: Changing in temp

Chemical energy: Change in chemical

Buoyancy: difference in density of object + fluid

Lithosphere: - crust / earthquakes occur

Asthenosphere: - hotter, than crust, mostly solid

Why Melting Occurs at Subduction Zones: Because the pressure
cause lithosphere to release water changing composition melts

MAKE SURE EVERYONE UNDERSTANDS THESE IDEAS BEFORE MOVING ON! Doug

B. Label the diagram above to indicate the types of energy driving plate tectonics processes, including magma production.

ISP203A – Global Change
Buoyancy

- C. Complete the table below and identify the causal processes involved with magma rising through the lithosphere.

Factors Impacting:	Aspects of the magma or surrounding lithosphere:
Density of the magma	magma ↓ as it melts Temp lithosphere density ↑
Buoyancy of the magma/lithosphere system	composition

- D. When magma rises through the crust, the magma cools and the crust gets hotter as heat is transferred from the magma to the crust. Explain what happens to density during this process and how it will affect a magma rising through the crust:

Magma cooling:

As the magma cools, the density ↑ causing it to stop rising

Crust warming:

As magma warms the crust will warm and magma will push it down because it becomes less dense

- E. Ocean crust is dense and composed mostly of basalt, while continental crust is lower in density and composed mostly of granite. Considering the density differences, would the buoyant force on a basaltic magma be greater in the ocean crust or the continental crust? Explain your reasoning.

It would have a greater buoyant force in the ocean crust because of composition it would be the same

Class Notes

GROUP #: L

Student IDs of Members Present:

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Part 2. Group Work

A. Step back for a moment. In your group's own words, explain the following ideas:

Gravitational energy: Energy created through the downward force of gravity

Thermal energy: Energy released as temp. increases or decreases

Chemical energy: Energy created dependent on molecular composition.

Buoyancy: How well material floats

Lithosphere: The buoyant outer material of the earth

Asthenosphere: The denser inner layer of the earth.

Why Melting Occurs at Subduction Zones:

MAKE SURE EVERYONE UNDERSTANDS THESE IDEAS BEFORE MOVING ON!

B. Label the diagram above to indicate the types of energy driving plate tectonics processes, including magma production.

ISP203A – Global Change
Buoyancy

- C. Complete the table below and identify the causal processes involved with magma rising through the lithosphere.

Factors Impacting:	Aspects of the magma or surrounding lithosphere:
Density of the magma	Thermal Composition
Buoyancy of the magma/lithosphere system	less dense; melt

- D. When magma rises through the crust, the magma cools and the crust gets hotter as heat is transferred from the magma to the crust. Explain what happens to density during this process and how it will affect a magma rising through the crust:

Magma cooling: Magma becomes more dense and solidifies.

Crust warming: Density of crust decreases and magma rises through easier.

- E. Ocean crust is dense and composed mostly of basalt, while continental crust is lower in density and composed mostly of granite. Considering the density differences, would the buoyant force on a basaltic magma be greater in the ocean crust or the continental crust? Explain your reasoning.

Buoyant force would be greater on ocean crust because more pressure from water is exerted on the magma.

Class Notes

GROUP #: 
Student IDs of Members Present:

A [redacted] A34305310
[redacted] A12383975

[redacted] A12773599
[redacted] A13915317



G T/C

Part 2. Group Work

A. Step back for a moment. In your group's own words, explain the following ideas:

Gravitational energy: energy associated with objects attraction to one another

Thermal energy: energy associated with the movement of molecules

Chemical energy: energy associated with the composition of molecules

Buoyancy: The force that is the same as the fluid that is displaced by an object

Lithosphere: brittle, upper layer of mantle

Asthenosphere: solid, denser layer of mantle below the lithosphere

Why Melting Occurs at Subduction Zones: composition + water + the right temp and pressure, along with added water, causes rocks to melt

MAKE SURE EVERYONE UNDERSTANDS THESE IDEAS BEFORE MOVING ON!

B. Label the diagram above to indicate the types of energy driving plate tectonics processes, including magma production.

ISP203A – Global Change
Buoyancy

C. Complete the table below and identify the causal processes involved with magma rising through the lithosphere.

Factors Impacting:	Aspects of the magma or surrounding lithosphere:
Density of the magma	lower density will rise and "sit" above the higher density — composition (+water) temp.
Buoyancy of the magma/lithosphere system	lower density allows it to be more buoyant, where a higher density will be less buoyant — density, temp.

D. When magma rises through the crust, the magma cools and the crust gets hotter as heat is transferred from the magma to the crust. Explain what happens to density during this process and how it will affect a magma rising through the crust:

Magma cooling: cooler temperature will cause the magma to be more dense, which will cause it to sink below less dense material

Crust warming: Warmer temperature will cause the crust to be less dense, which will cause it to rise up over more dense material

E. Ocean crust is dense and composed mostly of basalt, while continental crust is lower in density and composed mostly of granite. Considering the density differences, would the buoyant force on a basaltic magma be greater in the ocean crust or the continental crust? Explain your reasoning.

The basaltic magma would be more buoyant in the ocean crust. Since the continental crust is ^{made of a} less dense material than ocean crust, and the magma is made of the same material as the ocean crust, the basaltic magma would sink more in this less dense continental material than in a more dense ocean material from which it is made

Class Notes

GROUP #: N
Student IDs of Members Present:
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Part 2. Group Work

Gravity

A. Step back for a moment. In your group's own words, explain the following ideas:

Gravitational energy: Form of Energy caused by gravity.

Thermal energy: Form of heat energy

Chemical energy: Form of energy related to Thermal Energy, deals with formation and breaking of bonds

Buoyancy: Relative difference between density of object and fluid it is in

Lithosphere: Where all Earthquakes occur

Asthenosphere: Mostly solid little magma, under higher pressure and temperature

Why Melting Occurs at Subduction Zones: Change in composition + addition of water

MAKE SURE EVERYONE UNDERSTANDS THESE IDEAS BEFORE MOVING ON!

B. Label the diagram above to indicate the types of energy driving plate tectonics processes, including magma production.

ISP203A – Global Change
Buoyancy

- C. Complete the table below and identify the causal processes involved with magma rising through the lithosphere.

Factors Impacting:	Aspects of the magma or surrounding lithosphere:
Density of the magma	Composition changes + water through minerals added
Buoyancy of the magma/lithosphere system	Buoyancy and temp stops rising as it cools

- D. When magma rises through the crust, the magma cools and the crust gets hotter as heat is transferred from the magma to the crust. Explain what happens to density during this process and how it will affect a magma rising through the crust:

Magma cooling: Magma becomes more dense
Magma stops rising as it becomes more dense

Crust warming: Crust becomes less dense

- E. Ocean crust is dense and composed mostly of basalt, while continental crust is lower in density and composed mostly of granite. Considering the density differences, would the buoyant force on a basaltic magma be greater in the ocean crust or the continental crust? Explain your reasoning.

The magma would be greater in the ocean because it has some of the same composition

Class Notes

GROUP #: 0

Student IDs of Members Present:

A41260816

A43643310

A34590917

A41096642



chemical & thermal energy

thermal energy

gravitational energy
&
thermal energy

Part 2. Group Work

A. Step back for a moment. In your group's own words, explain the following ideas:

Gravitational energy: Energy that is pulled down and cause by the earth's gravity pull.

Thermal energy: Energy generated from heat in the atmosphere and other sources

Chemical energy: The energy generated from phase changes of objects.

Buoyancy: the process that materials rise and sink

Lithosphere: the layer ~~between~~ that is brittle, cold and breaks easily

Asthenosphere: the layer that is bendable, solid and hot

Why Melting Occurs at Subduction Zones:

Because the composition and the presence of water molecules that are being released

MAKE SURE EVERYONE UNDERSTANDS THESE IDEAS BEFORE MOVING ON!

B. Label the diagram above to indicate the types of energy driving plate tectonics processes, including magma production.

ISP203A – Global Change
Buoyancy

- C. Complete the table below and identify the causal processes involved with magma rising through the lithosphere.

Factors Impacting:	Aspects of the magma or surrounding lithosphere:
Density of the magma	the magma has to be less dense than the surrounding lithosphere so it just starts to peel.
Buoyancy of the magma/lithosphere system	its going to melt, rise and be less dense than the rocks around it.

- D. When magma rises through the crust, the magma cools and the crust gets hotter as heat is transferred from the magma to the crust. Explain what happens to density during this process and how it will affect a magma rising through the crust:

Magma cooling:

the magma is cooling and becoming more dense so it is sinking and ~~is~~ being pulled down by gravity and it is cooling so when it reaches the crust that warming they are the same temperature so they stop.

Crust warming:

the crust is warming and becoming less dense so it is rising and when the crust reaches the magma and they become the same temperature it stops.

- E. Ocean crust is dense and composed mostly of basalt, while continental crust is lower in density and composed mostly of granite. Considering the density differences, would the buoyant force on a basaltic magma be greater in the ocean crust or the continental crust? Explain your reasoning.

melted basalt
granite
basalt



melted basalt moving through ocean floor.

Class Notes



Part 2. Group Work

A. Step back for a moment. In your group's own words, explain the following ideas:

Gravitational energy: gravitational force when matter attracts matter.

Thermal energy: energy resulting when atoms and molecules move.

Chemical energy: energy that results from a chemical reaction.

Buoyancy: difference between pressure at the top of an object and the force resulting from the bottom.

Lithosphere: outer shell of earth's surface.

Asthenosphere: solid level beneath lithosphere.

Why Melting Occurs at Subduction Zones: because water is released into lithosphere and changes density levels.

MAKE SURE EVERYONE UNDERSTANDS THESE IDEAS BEFORE MOVING ON!

B. Label the diagram above to indicate the types of energy driving plate tectonics processes, including magma production.

ISP203A – Global Change
Buoyancy

- C. Complete the table below and identify the causal processes involved with magma rising through the lithosphere.

Factors Impacting:	Aspects of the magma or surrounding lithosphere:
Density of the magma	Affected by the addition of water.
Buoyancy of the magma/lithosphere system	Magma in lithosphere rises when density goes down.

- D. When magma rises through the crust, the magma cools and the crust gets hotter as heat is transferred from the magma to the crust. Explain what happens to density during this process and how it will affect a magma rising through the crust:

Magma cooling:

Cooling increases density levels.

Crust warming:

Warming decreases density and when it reaches equilibrium, the process stops.

- E. Ocean crust is dense and composed mostly of basalt, while continental crust is lower in density and composed mostly of granite. Considering the density differences, would the buoyant force on a basaltic magma be greater in the ocean crust or the continental crust? Explain your reasoning.

The buoyant force pressure is greater than the force of the oceanic crust due to the amount of weight on top, which creates increased pressure.



thermal

chemical

gravitational

Part 2. Group Work

A. Step back for a moment. In your group's own words, explain the following ideas:

Gravitational energy: caused by pressure exerted on an object

Thermal energy: caused by movement and temperature.

Chemical energy: caused by the structure of an object (makeup)

Buoyancy: happens sink in SC due to difference in relative density

Lithosphere: cold and brittle area below ocean + continent

Asthenosphere: hot and more malleable area w/ more pressure on it

Why Melting Occurs at Subduction Zones: rock melts when water is added and a composition change occurs

MAKE SURE EVERYONE UNDERSTANDS THESE IDEAS BEFORE MOVING ON!

B. Label the diagram above to indicate the types of energy driving plate tectonics processes, including magma production.

ISP203A – Global Change
Buoyancy

C. Complete the table below and identify the causal processes involved with magma rising through the lithosphere.

Factors Impacting:	Aspects of the magma or surrounding lithosphere:
Density of the magma	composition change occurs, so the magma starts melting + the density
Buoyancy of the magma/lithosphere system	temperature/gravity

D. When magma rises through the crust, the magma cools and the crust gets hotter as heat is transferred from the magma to the crust. Explain what happens to density during this process and how it will affect a magma rising through the crust:

Magma cooling: the density will increase because as temperature decreases, densifying will increase.

Magma stops because it reaches equilibrium with the surrounding rock.

Crust warming: density will decrease because as temperature increases, density will decrease.

As magma rises through the crust, its density increases, as magma sinks its density decreases.

E. Ocean crust is dense and composed mostly of basalt, while continental crust is lower in density and composed mostly of granite. Considering the density differences, would the buoyant force on a basaltic magma be greater in the ocean crust or the continental crust? Explain your reasoning.

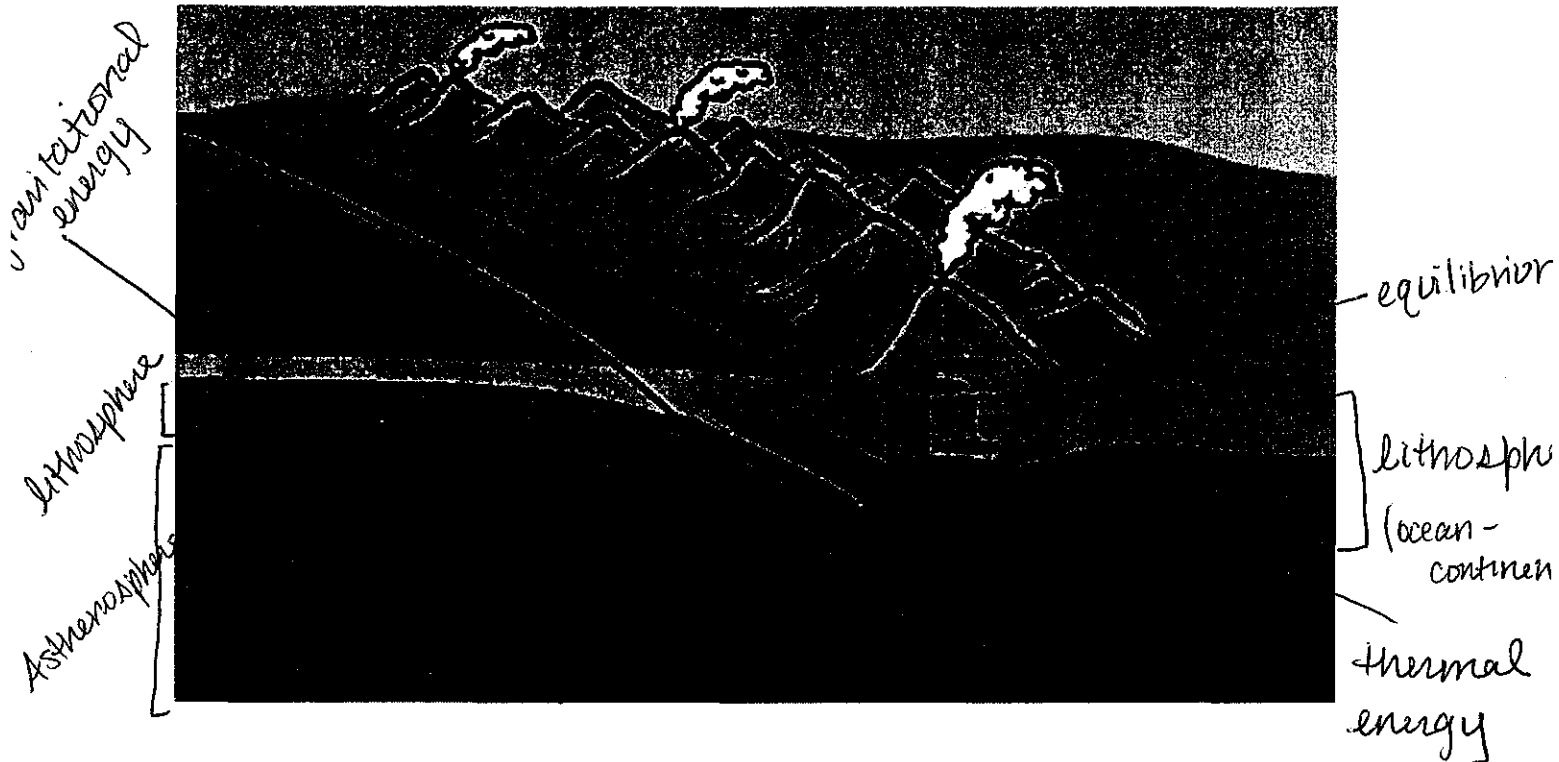
The ocean crust would be more buoyant because it is more dense than continental crust and more dense objects are more buoyant.

the gap between the density of melted basalt and basalt is the largest, and this caused greater buoyant force.

[melted basalt
 [granite
 [basalt

Class Notes

GROUP #: R
Student IDs of Members Present:
A39979826, A40711436
A40688630 A40994271



Part 2. Group Work

A. Step back for a moment. In your group's own words, explain the following ideas:

Gravitational energy: the pull of materials towards the center of the earth

Thermal energy: the increase of temperature which causes density to decrease

Chemical energy: the reaction of chemicals due to a collision of earth's energy

Buoyancy: the rise & fall of materials due to the relative density of the materials

Lithosphere: brittle rock where earthquakes occur

Asthenosphere: solid rock beneath the lithosphere that has bendable rocks

Why Melting Occurs at Subduction Zones: water from the lithosphere which is under more pressure which releases water molecules due to composition

MAKE SURE EVERYONE UNDERSTANDS THESE IDEAS BEFORE MOVING ON! change

B. Label the diagram above to indicate the types of energy driving plate tectonics processes, including magma production.

ISP203A – Global Change
Buoyancy

- C. Complete the table below and identify the causal processes involved with magma rising through the lithosphere.

Factors Impacting:	Aspects of the magma or surrounding lithosphere:
Density of the magma	composition change - water is added to change density
Buoyancy of the magma/lithosphere system	lithosphere pushes down into the earth causing the creation of magma due to composition

- D. When magma rises through the crust, the magma cools and the crust gets hotter as heat is transferred from the magma to the crust. Explain what happens to density during this process and how it will affect a magma rising through the crust:

Magma cooling: When magma reaches the crust the temperature decreases causing the density to increase & the magma cools.

Crust warming: the magma transfers thermal energy to the ~~crust~~ crust because it is becoming more dense & is losing its heat to the crust around it.

- E. Ocean crust is dense and composed mostly of basalt, while continental crust is lower in density and composed mostly of granite. Considering the density differences, would the buoyant force on a basaltic magma be greater in the ocean crust or the continental crust? Explain your reasoning.

The buoyant force on a basaltic magma would be greater in the continental crust because there is more pressure in the continental crust versus the density in the ocean crust. This means the continental crust has the most density

ISP203A – Global Change
Buoyancy

Objectives

- Use the concept of buoyancy to explain how magmas rise

Causal Principles

1. Gravitational energy, thermal energy, and/or chemical **energy** drive all movement and change of matter on Earth.
2. A system is in **equilibrium** when energy in the system is balanced.
5. **Temperature** is a measure of the movement of molecules. Higher temperature means molecules are moving faster.
6. When molecules move faster, the **density** of most substances decreases. Water is an anomaly because liquid water is more dense than ice.
7. **Buoyancy** causes materials to rise or fall due to the relative density of materials.

PART 1: Background Notes

Class Notes

GROUP #: S
Student IDs of Members Present:
A43292970 A43856550
A39127449
A43294133



Part 2. Group Work

A. Step back for a moment. In your group's own words, explain the following ideas:

Gravitational energy: Forces that drive objects towards the Earth and towards one another.

Thermal energy: Energy that results from movement of molecules

Chemical energy: Energy based on arrangement of molecules

Buoyancy: relation between densities of different materials

Lithosphere: consists of the crust and the upper part of the mantle

Asthenosphere: the part of the mantle below the lithosphere

Why Melting Occurs at Subduction Zones:

water changes the composition in the crust and can cause the solid rock to melt

MAKE SURE EVERYONE UNDERSTANDS THESE IDEAS BEFORE MOVING ON!

B. Label the diagram above to indicate the types of energy driving plate tectonics processes, including magma production.

ISP203A – Global Change
Buoyancy

- C. Complete the table below and identify the causal processes involved with magma rising through the lithosphere.

Factors Impacting:	Aspects of the magma or surrounding lithosphere:
Density of the magma	When the rock melts it becomes less dense causing it to rise.
Buoyancy of the magma/lithosphere system	Magma cools as it rises and the lithosphere warms. The differences in density will move towards equilibrium and cause the magma to stop rising.

- D. When magma rises through the crust, the magma cools and the crust gets hotter as heat is transferred from the magma to the crust. Explain what happens to density during this process and how it will affect a magma rising through the crust:

Magma cooling:

The magma becomes more dense.

Crust warming:

The crust becomes less dense.

The buoyancy between the two causes the magma to stop rising.

- E. Ocean crust is dense and composed mostly of basalt, while continental crust is lower in density and composed mostly of granite. Considering the density differences, would the buoyant force on a basaltic magma be greater in the ocean crust or the continental crust? Explain your reasoning.

The buoyancy would be greater on continental crust because the continental crust is less dense. The differences between the densities of the magma and the crust would be greater.

ISP203A – Global Change
Buoyancy

Part 3: Homework

If you complete the group work, you may work on the homework on your own. This means your answers should be generally unique from other students' answers. **Submit your homework using ANGEL.**

When magmas rise close to the surface, gas bubbles in the magma leak out of fractures in surrounding rock.

- a. How do the gas bubbles affect the density of the magma?
- b. If the gas leaves the magma, how would it impact the buoyancy of the magma?
- c. If all of the gas in the magma leaks out, would the magma continue to rise, or would the magma stop rising and cool in place?

During subduction, water found in minerals of the oceanic lithosphere is released into the mantle. This process causes magma to form.

- a. How does the water affect the melting point of the surrounding rock?
- b. Once the rock is magma, why does it rise?
- c. The lithosphere is solid rock. How does the magma change the surrounding rock so that it can rise through solid rock?

Class Notes

GROUP #: T

Student IDs of Members Present:

A39743811

A42185423

A39737915



Part 2. Group Work

A. Step back for a moment. In your group's own words, explain the following ideas:

Gravitational energy: energy that causes two objects to come together due to attraction.

Thermal energy: movement of molecules, the faster they go the hotter they become.

Chemical energy: change in form of bonds of molecules.

Buoyancy: causes materials to rise or fall due to density of materials.

Lithosphere: Breakable part of earth that is tectonic plates.

Asthenosphere: The bendable part of earth below lithosphere.

Why Melting Occurs at Subduction Zones: at the proper temperature & pressure the composition is changed by the addition of water.

MAKE SURE EVERYONE UNDERSTANDS THESE IDEAS BEFORE MOVING ON!

B. Label the diagram above to indicate the types of energy driving plate tectonics processes, including magma production.

ISP203A – Global Change
Buoyancy

- C. Complete the table below and identify the causal processes involved with magma rising through the lithosphere.

Factors Impacting:	Aspects of the magma or surrounding lithosphere:
Density of the magma	Pressure because as the pressure increases density decreases
Buoyancy of the magma/lithosphere system	Temperature the warm magma rises & then cools but raises temp. of crust

- D. When magma rises through the crust, the magma cools and the crust gets hotter as heat is transferred from the magma to the crust. Explain what happens to density during this process and how it will affect a magma rising through the crust:

Magma cooling: increase in density because as the magma is cooling the temperature is decreasing & the density is increasing

Crust warming: decrease in density as the crust is warming it is increasing in temperature because it is warmed by the warm melted magma. the magma cools and becomes denser and stops rising.

- E. Ocean crust is dense and composed mostly of basalt, while continental crust is lower in density and composed mostly of granite. Considering the density differences, would the buoyant force on a basaltic magma be greater in the ocean crust or the continental crust? Explain your reasoning.

The buoyant force would be greater in the continental crust because that is where the temperature and pressure are at the correct levels for rock to melt when the composition is changed by the addition of water

Class Notes

GROUP #: X
Student IDs of Members Present:

~~1000~~ A43398594
~~1000~~ A31630993



Part 2. Group Work

A. Step back for a moment. In your group's own words, explain the following ideas:

Gravitational energy: movement of material toward toward the center of the earth.

Thermal energy: energy from when heat is released.

Chemical energy: energy from the making and breaking of chemical bonds

Buoyancy: materials sink or rise due to differences in density of material

Lithosphere: top layer of earth's crust. Flows on asthenosphere. Colder and more brittle.

Asthenosphere: solid top layer of crust under lithosphere, higher temp and not brittle.

Why Melting Occurs at Subduction Zones: melting occurs at subduction zone b/c

the earth is warmer as you move towards the center and cool ocean floor subducting creates higher pressure
MAKE SURE EVERYONE UNDERSTANDS THESE IDEAS BEFORE MOVING ON!

B. Label the diagram above to indicate the types of energy driving plate tectonics processes, including magma production.

→ water in the lithosphere from new crust.

ISP203A – Global Change
Buoyancy

C. Complete the table below and identify the causal processes involved with magma rising through the lithosphere.

Factors Impacting:	Aspects of the magma or surrounding lithosphere:
Density of the magma	the less dense magma rises above the more dense lithosphere. The pressure effects the ^{density} buoyancy .
Buoyancy of the magma/lithosphere system	the liquid magma is more buoyant than the lithosphere and rises to the top.

D. When magma rises through the crust, the magma cools and the crust gets hotter as heat is transferred from the magma to the crust. Explain what happens to density during this process and how it will affect a magma rising through the crust:

Magma cooling: As magma cools it heats the surrounding crust lowering its density. As the crust ~~heats~~ ^{heats} and magma they become closer and temp and meet an equilibrium.

Crust warming: The density of the ^{crust} ~~crust~~ decreases as the warm magma heats it as it rises. As the magma cools they become closer in temperature and meet an equilibrium.

E. Ocean crust is dense and composed mostly of basalt, while continental crust is lower in density and composed mostly of granite. Considering the density differences, would the buoyant force on a basaltic magma be greater in the ocean crust or the continental crust? Explain your reasoning.

The buoyant force will be greater in the ocean crust b/c it is more dense than continental crust. Ocean crust sinks below continental crust at subduction zones which is driven by gravity and buoyancy.

ISP203A – Global Change
Buoyancy

Objectives

- Use the concept of buoyancy to explain how magmas rise

Causal Principles

1. Gravitational energy, thermal energy, and/or chemical **energy** drive all movement and change of matter on Earth.
2. A system is in **equilibrium** when energy in the system is balanced.
5. **Temperature** is a measure of the movement of molecules. Higher temperature means molecules are moving faster.
6. When molecules move faster, the **density** of most substances decreases. Water is an anomaly because liquid water is more dense than ice.
7. **Buoyancy** causes materials to rise or fall due to the relative density of materials.

PART 1: Background Notes

Class Notes

GROUP #: **Y**
Student IDs of Members Present:
A40491423
A42837304



Part 2. Group Work

A. Step back for a moment. In your group's own words, explain the following ideas:

Gravitational energy: Kinetic + potential pulls two objects together

Thermal energy: energy of heat that happens when molecules move

Chemical energy: relates to the arrangement of atoms + molecules

Buoyancy: the force that is equal to the weight of the water the object

Lithosphere: the crust and upper mantle of the Earth

Asthenosphere: below the lithosphere, where seismic waves are transmitted, colder + harder

Why Melting Occurs at Subduction Zones: magma rising in the lithosphere, water from the ocean and the lithosphere reactions

MAKE SURE EVERYONE UNDERSTANDS THESE IDEAS BEFORE MOVING ON!

B. Label the diagram above to indicate the types of energy driving plate tectonics processes, including magma production.

ISP203A – Global Change
Buoyancy

- C. Complete the table below and identify the causal processes involved with magma rising through the lithosphere.

Factors Impacting:	Aspects of the magma or surrounding lithosphere:
Density of the magma	increase temperature, increase pressure, change in composition
Buoyancy of the magma/lithosphere system	gassy , relative density of materials, pressure

- D. When magma rises through the crust, the magma cools and the crust gets hotter as heat is transferred from the magma to the crust. Explain what happens to density during this process and how it will affect a magma rising through the crust:

Magma cooling: The density would ~~decrease~~^{increase} because the temperature decreases and the ~~the~~ magma will rise faster and transfer the heat to the crust

Crust warming: The density would decrease because the temperature is increasing. Once the magma and crust reach an equilibrium then the temperature and, therefore, density will stay where they are at

- E. Ocean crust is dense and composed mostly of basalt, while continental crust is lower in density and composed mostly of granite. Considering the density differences, would the buoyant force on a basaltic magma be greater in the ocean crust or the continental crust? Explain your reasoning.

The continental crust ~~is~~ has lower density than the ocean crust, so the buoyant force would be greater on the ocean crust. Since the ocean crust is less dense, the buoyant force would be less as well.

more molecules more dense
magma more dense
hotter less
colder more

ISP203A – Global Change
Buoyancy

Part 3: Homework

If you complete the group work, you may work on the homework **on your own**. This means your answers should be generally unique from other students' answers. **Submit your homework using ANGEL.**

When magmas rise close to the surface, gas bubbles in the magma leak out of fractures in surrounding rock.

- a. How do the gas bubbles affect the density of the magma?
- b. If the gas leaves the magma, how would it impact the buoyancy of the magma?
- c. If all of the gas in the magma leaks out, would the magma continue to rise, or would the magma stop rising and cool in place?

During subduction, water found in minerals of the oceanic lithosphere is released into the mantle. This process causes magma to form.

- a. How does the water affect the melting point of the surrounding rock?
- b. Once the rock is magma, why does it rise?
- c. The lithosphere is solid rock. How does the magma change the surrounding rock so that it can rise through solid rock?